



Sixty years of research of tick-borne encephalitis--A basis of the current knowledge of the epidemiological situation in Central Europe

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Abstract:

Tick-borne encephalitis (TBE) virus was isolated for the first time in Central Europe in 1948 from both a patient and *Ixodes ricinus* ticks collected in the area where the patient had been tick bitten (the Beroun area - Central Bohemia) and concomitantly from a TBE patient in Moravia (the Vyskov area). Another priority discovery was alimentary transmission of TBE virus via the milk from tick infected grazing goats that was made during a TBE outbreak in Roznava (SE Slovakia). This outbreak of 660 cases has been the largest of its kind. Both of these discoveries were a challenge to multidisciplinary research into the natural focality of TBE. The results obtained were published by Czech and Slovak authors in the first European TBE monograph (1954) and were the stimulus for further research in this area. From the epidemiological point of view, among others, the impact of meteorological factors (on TBE incidence associated with *I. ricinus* host-seeking activity) and recreational nature of TBE were clearly defined then. At the same time, TBE became a notifiable disease (since 1971 laboratory confirmed TBE cases only). In the following decades, the phenomenon of natural focality of TBE (including anthropic impacts) was extensively studied and the determinants of high-risk areas in the field were analyzed. The results were used in the creation of *I. ricinus* and TBE risk prediction maps for the Czech Republic generated for the first time in Europe using LandSAT 5 satellite data and GIS technology (1990). In the early 1990s (in particular since 1993), similarly to other countries, the Czech Republic reported a sharp rise in TBE cases that continues, with some fluctuations, until now. The cooperation with climatologists in the analysis of historical data, current epidemiological observations, and study of *I. ricinus* in the field have shown a decisive impact of the ongoing climate change. The analysis of the socio-economic conditions in high-risk areas for TBE has not revealed any impact of these conditions on TBE morbidity. The recreational factor that is influenced by the weather changes has a considerable impact. The seasonal trend of TBE cases shows large fluctuations as were seen in 2006, 2009, and 2010, also as a result of weather changes with seasons. This clearly implies the need for using long time series of data, covering at least a decade, to be able to draw general conclusions as is the case in the present study (2001-2010). The data broken down by Administrative Region display substantial interregional differences. Of 14 Administrative Regions of the Czech Republic, three exhibits a linear trend in TBE incidence, with a minimum deviation from the baseline, four Regions show different downward linear trends, but seven Regions display different upward trends. The upward trend is most obvious in the Highlands (Vysocina) Region where it is associated with the prevalent orographic conditions and increase in the incidence of *I. ricinus* ticks at higher altitudes. The knowledge of the area where the patient was tick bitten that is entered in the Epidat database as the "probable area of TBE infection acquisition" is helpful in identifying high-risk areas for TBE. By matching the area of TBE acquisition with that of the patient's

domicile we revealed that TBE patients had to travel to areas other than their area of domicile to acquire TBE and thus also significance of the areas of TBE acquisition at the country level. The population of the Prague Region (NUTS3 CZ010) can be used as an illustrative example, with 37.7% of TBE cases only reported to be acquired in the Prague Region while 33.4% of TBE cases were associated with travel to the Central Bohemian Region and 13.9% of TBE cases were imported from the South Bohemian Region (the rates of TBE cases imported from other Regions were less than 5%). and conversely, the residents of the South Bohemian Region (CZ031), with the highest number of TBE cases ever in the Czech Republic, acquired TBE in the region of domicile at a rate of 99.5%. These rates are clearly associated with the recreational potential of various Regions. The probable area of TBE acquisition is identified by cadastral community. In the light of the natural focality of TBE, the analysis of the local environmental factors involved in the circulation of TBE virus in the wild environment is required to determine the high-risk areas and local risk level. Although outbreaks of TBE cases in humans are indicative of TBE natural foci, more data is needed to delineate such areas. and similarly, the absence of TBE cases in humans over a period of time may not be indicative of a no risk area.

Resource Description

Exposure :

weather or climate related pathway by which climate change affects health

Ecosystem Changes, Temperature, Unspecified Exposure

Temperature: Fluctuations

Geographic Feature:

resource focuses on specific type of geography

None or Unspecified

Geographic Location:

resource focuses on specific location

Non-United States

Non-United States: Europe

European Region/Country: European Country

Other European Country : Czech Republic

Health Impact:

specification of health effect or disease related to climate change exposure

Infectious Disease

Infectious Disease: Vectorborne Disease

Vectorborne Disease: Tick-borne Disease

Tick-borne Disease: Tick-borne Encephalitis

Population of Concern: A focus of content

Climate Change and Human Health Literature Portal

Population of Concern:

populations at particular risk or vulnerability to climate change impacts

Children, Elderly

Resource Type:

format or standard characteristic of resource

Research Article

Timescale:

time period studied

Time Scale Unspecified